

**ELECTRICAL FUSE RELAY BOX, APPARATUS, METHODS, AND**  
**ARTICLES OF MANUFACTURE**

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**CROSS-REFERENCE TO RELATED APPLICATIONS**

[0001] This application claims the benefit of United States Provisional Patent Application Number 60/399,649 filed July 30, 2002, the complete disclosure of which is hereby incorporated by reference.

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**FIELD OF THE INVENTION**

[0002] The present invention generally relates to electrical fuse relay boxes, apparatus, methods, and articles of manufacture, and more particularly to pre-assembled electrical fuse relay boxes for mounting in the engine or passenger compartment of a motor vehicle.

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**BACKGROUND OF THE INVENTION**

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[0003] Fuse boxes are utilized in many applications, one example of which being motor vehicles. Typically, fuse boxes are placed in within a designated area on a motor vehicle, such as, for example, under the hood within the engine compartment or under the dashboard and near the foot area of the interior of the motor vehicle. Generally, fuse boxes accept house electrical fuses for individual electrical load components consumers within the motor vehicle, such as individual lights or small electrical equipment items, and also accept

house electrical fuses for large cables strands carrying larger amounts of current splitting off from the fuse box for servicing entire load sections within the motor vehicle. Moreover, fuses are also used in automotive electrical systems to protect circuits against potential damage caused by overload conditions, such as a result of multiple electrical load requirements and surges occurring simultaneously. Usually, fuses for various circuits are collected together at a confluence point, known as a fuse box, a fuse relay box, a power distribution block, or a junction block.

[0004] Conventionally and as practiced in the art, a fuse box is a molded plastic structure containing electrical terminals, one or more bus bars, and various other electrical components, such as circuit breakers and diodes integrated together. The fuses are maintained in terminal sockets integrally molded on the outer surface of the fuse box. Typical automotive fuses have a generally rectangular plastic body with a pair of contacts extending from one end, and when the fuse is fully inserted into its respective terminal socket, the contacts engage electrical terminals inside of the fuse box to complete a circuit.

[0005] However, each electrical subcomponent that is incorporated into a conventional electrical fuse relay box, such as a plastic box, relays, fuses (e.g., mini, maxi, J-Case), circuit breakers, and diodes, etc. (collectively referred to as "electrical components"), are often ordinarily manufactured separately and purchased individually from different suppliers, and must be assembled collectively to be integrated within a finished fuse relay box. This process of assembly is often time consuming, expensive, and susceptible to errors in connections, and overall deficient quality. Moreover, conventional fuse boxes are generally manufactured without covers, and therefore are susceptible to damage.

[0006] Therefore, there is a need for a novel pre-assembled fuse box system having all electrical components preset to their correct position, and which may be readily mounted within motor vehicle compartments quickly, easily, and without error. Moreover, there is a need for a system that enables customers to receive all of the electrical components already  
5 incorporated in the fuse box without requiring further assembly of the electrical components to form a unified device.

## SUMMARY OF THE INVENTION

10 [0007] In view of the foregoing and other problems, disadvantages, and drawbacks of the conventional fuse boxes the present invention has been devised, various embodiments and it is an object of the present invention to provide a structure for a pre-assembled electrical fuse relay box are disclosed herein.

[0008] In accordance with one exemplary embodiment, a pre-assembled electrical  
15 fuse relay box, and a method of manufacturing the same is disclosed, comprising an upper frame having an upper compartment and a first locking receiver, a plurality of electrical components pre-assembled within the upper compartment, a lower frame having a lower compartment and a second locking receiver, wherein the lower frame is dimensioned and configured to engage the upper frame, a plurality of connector modules pre-assembled within  
20 the lower compartment, wherein the connector modules are dimensioned and configured to electrically engage electrical wires, spacers positioned within the lower compartment for locking the electrical wires, an upper cover pivotally mounted on the upper compartment, and a lower cover pivotally mounted on the lower compartment, wherein the upper cover

comprises a first locking member dimensioned and configured to engage the first locking receiver, and wherein the lower cover comprises a second locking member dimensioned and configured to engage the second locking receiver. Moreover, the electrical components comprise relays, circuit breakers, J-case fuses, and blade fuses. Additionally, the connector modules make an electrical connection with the electrical components.

[0009] One advantage of embodiments disclosed herein is that electrical components such as relays, fuses, diodes, and circuit breakers are already pre-assembled and are mounted in such a manner that they can easily be fixed into their final position. Therefore, the customer is not required to use special diagnostic equipment to assure that the components and connector modules are properly mounted and in the correct position.

[0010] Another advantage of embodiments disclosed herein is that an electrical fuse relay box is provided that includes both an upper cover and a lower cover, which allows mounting in the engine compartment of a car or other motor vehicle.

## **BRIEF DESCRIPTION OF THE DRAWINGS**

[0011] The foregoing will be better understood from the following detailed description with reference to the drawings, in which:

[0012] Figure 1 is a perspective view of an electrical fuse relay box according to one embodiment of the present invention;

[0013] Figure 2 is a schematic diagram of the electrical fuse relay box of Figure 1;

[0014] Figure 3 is a schematic diagram of the electrical fuse relay box of Figure 1 shown in the closed position; and

[0015] Figure 4 is a flow diagram illustrating an exemplary method in accordance with the present invention.

## DETAILED DESCRIPTION

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[0016] An embodiment of the present invention provides a fuse box having the capability to have electrical components pre-assembled and preset in such a manner that they can be easily fixed into their correct position, and which may also be readily mounted within a compartment quickly, easily, and without error.

10 [0017] Referring now to the drawings in detail, and more particularly to Figures 1 through 4, there are shown exemplary embodiments of the structures and methods according to the present invention. Figures 1 through 3 illustrate an electrical fuse relay box 100 comprising a plurality of electrical components 20 including relays 1, a circuit breaker 2, J-case fuses 3, and blade fuses 4 collectively pre-assembled, preset, and mounted in a pre-  
15 locked position within an upper frame 5, wherein the upper frame 5 is pivotally attached to an upper cover 7. Moreover, connector modules 6 are mounted in a final position within a lower frame 9, wherein the lower frame 9 is pivotally attached to a lower cover 8.

[0018] Preferably, the electrical fuse box 100 comprises an upper frame 5 and lower frame 9, a plurality of electrical components 20 pre-assembled within the upper frame 5, a  
20 plurality of connector modules 6 pre-assembled within the lower frame 9, an upper cover 7 mounted on the upper frame 5, and a lower cover 8 mounted on the lower frame 9, wherein the connector modules 6 are dimensioned and configured for electrically engaging electrical wires.

[0019] The upper frame 5 and lower frame 9 each comprise a locking receiver 32, 33, respectively, and each of the upper cover 7 and lower cover 8 comprise a locking member 34, 35, respectively, dimensioned and configured to engage the locking receiver 32, 33, respectively. Moreover, the upper cover 7 is pivotally mounted on the upper frame 5, and  
5 likewise, the lower cover 8 is pivotally mounted on the lower frame 9.

[0020] Preferably, the upper frame 5 includes an upper compartment 75 and the lower frame 9 includes a lower compartment 76, wherein the upper compartment 75 houses the electrical components 20, and the lower compartment 76 houses a plurality of connector modules 6. Moreover, the upper frame 5 comprises a pair of generally elongated sidewalls  
10 51, 52, which are positioned opposite one another, and are separated by a pair of end walls 30, 31. Similarly, the lower frame 9 comprises a pair of generally elongated sidewalls 61, 62, which are positioned opposite one another, and are separated by a pair of end walls 70, 71.

[0021] As illustrated in Figures 2 and 3, end wall 30 comprises a lock catch (locking  
15 receiver) 32, which is angled to provide a stable locking unit mechanism for the fuse box 100 upon closure. Moreover, end wall 30 on the upper frame 5 includes a generally U-shaped locking bracket 80, which engages a corresponding bracket guide 81 located on end wall 70 of the lower frame 5. Upon uniting the upper frame 5 with the lower frame 8, the locking bracket 80 slides within the bracket guide 81, and engages the lock catch 33 to provide stable  
20 closure of the fuse box 100.

[0022] As further illustrated in Figures 2 and 3, end walls 31, 71 each comprise at least one pivot hinge 38, 68, respectively, dimensioned and configured to receive a corresponding pivot member 36, 66, respectively. At least one pivot member 36 is

positioned on the upper cover 7 and pivotally mounts to pivot hinge 38, thereby allowing the upper cover 7 to articulate from an open to closed position. Likewise, at least one pivot member 66 is positioned on the lower cover 8 and pivotally mounts to pivot hinge 68, thereby allowing the lower cover 8 to articulate from an open to closed position.

5           **[0023]** The lower cover 8 further includes at least one locking clip 35, fixably attached to the free end 55 of the lower cover 8 in this embodiment, wherein the locking clip 35 protrudes outwardly from the lower cover 8. Furthermore, an opening 40 is provided in the lower cover 8 to allow for wires (not shown) to be guided into the fuse box 100. The locking clip 35 is dimensioned and configured to provide stable union with end wall 70  
10   upon closure of the lower cover 8 upon the lower frame 9.

**[0024]** The upper cover 7 further includes a locking member 34, fixably attached to the free end 65 of the upper cover 7 in this embodiment, wherein the locking member 34 comprises a protruding lip 42 for engaging the lock catch 32 of the end wall 30 of upper frame 9. Upon closure of the upper cover 7, the lip 42 engages lock catch 32, and the upper  
15   cover 7 becomes locked. Unlocking the upper cover 7 is accomplished by engaging a bias member 43, which is positioned opposite the lip 42 on the locking member 34.

**[0025]** Connector modules 6 are included in a pre-assembled, and preferably unlocked position, as best shown in Figure 2. The connector modules 6 are used for connecting the fuse box 100 with electrical power and are capable of receiving wire terminals  
20   (not shown) for wire connections.

**[0026]** According to the present embodiment, upper cover 7 is preferably supplied in a closed position and will be opened in order to push electrical components 20 into their final position, after terminals with wires (not shown) have been inserted. In this embodiment, the

connector modules 6 in the lower frame 9 are preferably in their final position, and separate spacers 10 are provided to lock the terminals with wires, after their insertion. The lower cover 8 is preferably supplied coupled and closed and will be opened to insert terminals with wires. Lower cover 8 is also known as a wire dress to those of ordinary skill in the art,  
5 because it protects and guides the wires after harness assembly. Again, lower cover 8 need only be opened to insert the electrical wires into the terminals.

[0027] The electrical components 20 in upper frame 5 are located in their final position but only in a pre-locked position, and are retained in place by upper frame 5 and by upper cover 7. The connector modules 6, which will receive the terminals with wires (not  
10 shown), are already in their final and locked position in the lower frame 9. Preferably, the lower cover 8 is pre-assembled coupled to the lower frame 9. Thereafter, the upper frame 5 and lower frame 9 are engaged using the locking clips 35 and locking bracket 80 as seen in Figure 3, thereby locking electrical components 20 into their final position to achieve an electrical connection.

15 [0028] A method of pre-assembling an electrical fuse relay box 100 is illustrated in the flow diagram shown in Figure 4. The method comprises mounting a plurality of electrical components in a pre-locked position within the upper compartment 75 of the upper frame 5 of the fuse box 100 at step 200. Second, a plurality of connector modules 6 and spacers 10 are mounted within the lower compartment 76 of the lower frame 9 of the fuse  
20 box 100 at step 210, wherein the connector modules 6 are configured for electrically engaging electrical wires, and wherein the connector modules 6 make an electrical connection with the electrical components 20. Next, an upper cover 7 is positioned on the upper compartment 75 of the upper frame 5 at step 220. Then, a lower cover is positioned



on the lower compartment 76 of the lower frame 9 at step 230. Thereafter, the spacers 10 lock the electrical wires into position at step 240. Next, the electrical components 20 are pushed into a set position at step 250. Finally, the electrical fuse relay box 100 is locked by attaching the upper frame to the lower frame at step 260.

5           **[0029]** The present embodiment has an advantage over conventional fuse frames whereby electrical components such as relays, fuses, diodes, and circuit breakers are already mounted in their final position. Therefore, the customer is not required to use special diagnostic equipment to assure that the components and connector modules are properly mounted and in the correct position.

10           **[0030]** Also, unlike the conventional systems, the electrical fuse relay box 100 of the present embodiment includes both an upper cover 7 and a lower cover 8, that enable mounting in the engine compartment of a car or other vehicles.

**[0031]** Although this invention has been described with reference to particular embodiments, it will be appreciated that many variations may be resorted to without  
15   departing from the spirit and scope of this invention as set forth in the appended claims.